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ABSTRACT

The first step of an energy conservation program is to monitor energy consumption. A system is explained that, in order to determine which buildings are energy efficient (considering all types of energy that a building might use), monitors total energy consumption. All such consumptions can be reduced to a common denominator: Barrels of Energy (BOE) or British Thermal Unit (BTU). The conversion factors are given for both calculations. To demonstrate how the procedure operates, figures of energy consumption (oil, gas, and electricity) are given for six fictitious buildings for two different years. Worksheets are provided to use in calculating which of the buildings is operating with the greatest degree of energy efficiency. (MLF)

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METROPOLITAN SCHOOL DISTRICT OF WASHINGTON TOWNSHIP
1605 E. 86th Street, Indianapolis, IN 46240

MAKING AN ENERGY CONSERVATION PROGRAM WORK

by
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Assistant Superintendents

During the gas shortage of 1977, the Metropolitan School District of Washington Township was directed by Citizen's Gas and Coke Utility to reduce its gas consumption to the 1973 gas usage level.

The coal shortage of 1978, although not induced by depletion of coal reserves from the mines, came within days of the Indianapolis Power and Light Company's requiring the district to reduce its consumption by 50%.

These were two grave situations which gave us highly meaningful evidence that the availability of energy was decreasing, and that the cost of the available energy was increasing. This produced a highly recognized need to do whatever possible to decrease our total energy consumption.

The question that we and many other school districts faced at these times was how significant energy use decreases could be accomplished in the most meaningful way. We, as have many others, started out by doing "things" like calibrating thermostats, inspecting and changing jets on fuel injection systems, turning off lights, etc. But even after doing these "things", we were still uncertain if our efforts were paying off in terms of truly meaningful energy conservation.

During the latter of these two crucial times, administrators in our district were invited to attend a seminar sponsored by Indiana Bell Telephone Company who shared with us their system of monitoring energy usage in all of their buildings throughout the state. They taught us a way to monitor total energy consumption through which we could determine which of our buildings were energy efficient when considering all types of energy that a building might use. They taught us how to reduce all such consumption to a common denominator, Barrels of Energy. (BOE).

Following are their conversion factors which reduce or convert the various forms of energy to Barrels of Energy. (BOE).

1 BOE = 0.02397 x gallons of fuel oil (#1,2,3 and diesel)
1 BOE = 0.01724 x CCF of Natural Gas
1 BOE = 0.0005883 x KWH of Electricity

After determining the total number of BOE's that each building uses for a fixed period of time, one can divide the BOE's by the square footage of the building, and compute BOE's per thousand feet. Buildings then can be ranked in terms of BOE/thousand square feet. This provides the first indication that a building is or is not energy efficient according to its rank among other buildings.

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Obviously, this procedure does not tell one why a building is not energy efficient, but it does tell one where to begin with more detailed analyses to determine how total energy can be reduced.

The following pages represent a set of fictitious buildings in a school district showing the square footage of each building, the units of energy used during Years A and B, as well as the BOE factors for each type of energy being consumed. Since it appears that the National Energy Act will require the use of BTU's, this unit may be substituted in the working papers for BOE's by using the following conversion factors:

The same net result can be acquired with BTU's as with BOE's.

138,000 BTU per gallon of fuel oil
103,000 BTU per CCF of natural gas
10,500 BTU per KWH of electricity

As a means of seeing how this set of procedures operates, may I suggest that you work through the following pages to see if you can determine which of the fictitious buildings is operating with the greatest degree of energy efficiency.

BED ROCK COMMUNITY SCHOOL CORPORATION

SCHOOL	SQ. FT.	OIL (gals.)		GAS (CCF)		ELECTRIC (KWH)	
		Year A	Year B	Year A	Year B	Year A	Year B
Eastrock Elem. School	43,909	29,205	26,843	----	----	228,244	229,000
Westrock Elem. School	68,688	63,704	63,476	2,708	3,240	324,240	319,320
Northrock Elem. School	59,236	29,307	32,481	2,544	3,296	574,880	457,440
Middle Rock Jr. High	74,505	----	----	78,624	82,802	790,800	649,500
Mammoth Rock High Sch.	148,255	----	----	177,750	215,700	2,468,199	2,640,400
Top Rock Admin. Bldg.	7,500	6,101	4,200	181	247	66,549	85,117

PROBLEM:

Rank the buildings as to their energy efficiency for the 2 years in question.

SCHOOL OR LOCATION

EASTROCK ELEMENTARY SCHOOL

SQUARE FEET 43,909

ADDITIONS _____ DATE _____ SQ. FT. _____

SQUARE FOOT AFTER ADDITION _____

YEAR A

ENERGY	UNITS	FACTOR	BOE	BOE/1000 SQ. FT.
Oil (Gallons)	29,205	.02397		
Gas (Therms)	----	----		
Electric (KWH)	228,244	.0005883		
Total Energy Usage				

YEAR B

ENERGY	UNITS	FACTOR	BOE	BOE/1000 SQ. FT.
Oil (Gallons)	26,843	.02397		
Gas (Therms)	----	----		
Electric (KWH)	229,000	.0005883		
Total Energy Usage				

SCHOOL OR LOCATION

WESTROCK ELEMENTARY SCHOOL

SQUARE FEET 68,688

ADDITIONS _____ DATE _____ SQ. FT. _____

SQUARE FOOT AFTER ADDITION _____

YEAR A

ENERGY	UNITS	FACTOR	BOE	BOE/1000 SQ. FT.
Oil (Gallons)	63,704	.02397		
Gas (Therms)	2,708	.01724		
Electric (KWH)	324,240	.0005883		
Total Energy Usage				

YEAR B

ENERGY	UNITS	FACTOR	BOE	BOE/1000 SQ. FT.
Oil (Gallons)	62,476	.02397		
Gas (Therms)	3,240	.01724		
Electric (KWH)	319,320	.0005883		
Total Energy Usage				

SCHOOL OR LOCATION

NORTHROCK ELEMENTARY SCHOOL

SQUARE FEET 59,236

ADDITIONS _____ DATE _____ SQ. FT. _____

SQUARE FOOT AFTER ADDITION _____

YEAR A

ENERGY	UNITS	FACTOR	BOE	BOE/1000 SQ. FT.
Oil (Gallons)	29,307	.02397		
Gas (Therms)	2,544	.01724		
Electric (KWH)	574,880	.0005883		
Total Energy Usage				

YEAR B

ENERGY	UNITS	FACTOR	BOE	BOE/1000 SQ. FT.
Oil (Gallons)	32,481	.02397		
Gas (Therms)	3,296	.01724		
Electric (KWH)	457,440	.0005883		
Total Energy Usage				

SCHOOL OR LOCATION

MIDDLE ROCK JUNIOR HIGH SCHOOL

SQUARE FEET 74,505

ADDITIONS _____ DATE _____ SQ. FT. _____

SQUARE FOOT AFTER ADDITION _____

YEAR A

ENERGY	UNITS	FACTOR	BOE	BOE/1000 SQ. FT.
Oil (Gallons)	----	----		
Gas (Therms)	78,624	.01724		
Electric (KWH)	790,800	.0005883		
Total Energy Usage				

YEAR B

ENERGY	UNITS	FACTOR	BOE	BOE/1000 SQ. FT.
Oil (Gallons)	----	----		
Gas (Therms)	82,802	.01724		
Electric (KWH)	6[illegible]9,500	.0005883		
Total Energy Usage				

SCHOOL OR LOCATION

MAMMOTH HIGH SCHOOL

SQUARE FEET 148,255

ADDITIONS _____ DATE _____ SQ. FT. _____

SQUARE FOOT AFTER ADDITION _____

YEAR A

ENERGY	UNITS	FACTOR	BOE	BOE/1000 SQ. FT.
Oil (Gallons)	----	----		
Gas (Therms)	177,750	.01724		
Electric (KWH)	2,468,199	.0005883		
Total Energy Usage				

YEAR B

ENERGY	UNITS	FACTOR	BOE	BOE/1000 SQ. FT.
Oil (Gallons)	----	----		
Gas (Therms)	215,700	.01724		
Electric (KWH)	2,640,400	.0005883		
Total Energy Usage				

SCHOOL OR LOCATION

TOP ROCK ADMINISTRATION BUILDING

SQUARE FEET 7,500

ADDITIONS _____ DATE _____ SQ. FT. _____

SQUARE FEET AFTER ADDITION _____

YEAR A

ENERGY	UNITS	FACTOR	BOE	BOE/1000 SQ. FT.
Oil (Gallons)	6,101	.02397		
Gas (Thermos)	181	.01724		
Electric (KWH)	66,549	.0005883		
Total Energy Usage				

YEAR B

ENERGY	UNITS	FACTOR	BOE	BOE/1000 SQ. FT.
Oil (Gallons)	4,200	.02397		
Gas (Thermos)	247	.01724		
Electric (KWH)	85,117	.0005883		
Total Energy Usage				

ENERGY REPORT
CALENDAR YEAR
19-- - 19--

SCHOOL_____

SQUARE FT._____

MONTH	GALLONS - FUEL OIL 19--	GALLONS - FUEL OIL 19--	GAS - 100 CCF 19--	GAS - 100 CCF 19--	ELECTRIC - KWH 19--	ELECTRIC - KWH 19--
January						
February						
March						
April						
May						
June						
July						
August						
September						
October						
November						
December						
TOTAL						